

# **NIH COMMON FUND HIGH-RISK HIGH-REWARD RESEARCH SYMPOSIUM**

**December 15 – 17, 2014**

**SPEAKER ABSTRACTS – DAY 2 (DEC. 16, 2014)**

## **Epigenetic Stochasticity, Phenotype and the Environment**

**Awardee:** Andrew P. Feinberg

**Award:** Pioneer Award

**Awardee Institution:** Johns Hopkins University School of Medicine

The overall theme of this Pioneer Award is the idea that natural selection will favor the emergence of genetic loci for epigenetic variation that can occur randomly or in response to environmental signals and affect phenotypes in which the environment changes unpredictably but often enough. We have pursued several avenues that all look promising. The first is a model of native honeybee populations with Brian Herb (JHU) and Gro Amdam (Arizona State). We have been generating a comprehensive genetic and epigenetic map related to foraging behavior and pollen production and identified SNPs that appear to regulate variance in methylation associated with behavioral phenotypes. The second is a model of nutrition-dependent metabolic disease in mouse, with Michael Multhaup and Will Wong (JHU) and Juleen Zierath and colleagues (Karolinska Institute), with epigenetic and genetic conservation over 50 million years to humans, showing environmentally sensitive genetic loci with wide epigenetic variability relevant to glucose homeostasis. The third is a novel stochastic mathematical approach, with Garrett Jenkinson, John Goutsias, and Elisabet Pujadas (JHU), to understanding the nature of epigenetic information and its relationship to environmental exposure and biological function. This has led to several new measures, including normalized methylation entropy, which turns out to be surprisingly relevant to the other approaches under the award.